

## **Adjusting for Highly Correlated Confounders Using Bayesian Mixture Models: A Study of Associations between Measures of Deprivation, Air Pollution Exposures and Health in London**

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### **Abstract**

Researchers often have to adjust for multiple highly correlated confounders when examining the association between exposures and health. This is generally the case in air pollution studies, where the effect of a particular exposure on a health outcome, such as lung cancer incidence, is examined after adjusting for multiple confounders, such as various measures of deprivation. Unfortunately, the highly inter-correlated nature of spatially distributed covariates such as deprivation scores makes it difficult to properly adjust for them in standard regression models due to well-known problems related to multi-collinearity. We propose a unified Bayesian mixture-model approach that iteratively clusters the confounders into groups, and random effects associated with these groups are then used as confounder adjustments in a regression model. The method is demonstrated with an example examining relationships between air pollution exposures, deprivation scores and health outcomes in small geographical regions throughout Greater London.